Foot]

SECTION 626 - FOUNDATIONS, CONDUIT, AND JUNCTION BOXES FOR HIGHWAY SIGNING, LIGHTING, AND SIGNALS

626.01 Description This work shall consist of furnishing, installing, modifying, or removing concrete foundations, conduits, and junction boxes for highway lighting, highway signing, and traffic signal installations in accordance with these specifications and in reasonably close conformity with the plans.

626.02 General The materials furnished by the Contractor shall be new. Where an existing system is to be modified, the existing material shall be removed and abandoned or salvaged as shown on the plans or as directed.

All electrical equipment shall conform to NEMA or UL standards, wherever applicable. In addition to these requirements, all materials and workmanship shall conform to the requirements of: NEC, ASTM Standards, the ANSI, the local electrical Utility Company, and any local ordinances that may apply.

Materials shall meet the requirements specified in the following Sections of Division 700, Material Details.

Reinforcing Steel	709.01
Precast Concrete Units	712.06
Steel Conduit	715.02
Non-metallic Conduit	715.03
Prewired Conduit	715.04
Metallic Junction and Fuse Box	715.05
Anchor Bolts	720.07

626.021 Miscellaneous Material Gravel backfill shall meet the requirements for Aggregate Base-Screened, Section 703.06 a., Type A.

Transformer pads shall conform to the requirements of the local electrical Utility Company.

If grouting is necessary to correct surface irregularities in the top of the concrete foundations, a non-shrink material satisfactory to the Resident shall be used.

All concrete foundations shall be constructed of Class A concrete in accordance with the applicable requirements of Section 502 - Structural Concrete.

626.022 Equipment List and Drawings Unless otherwise permitted in writing, the Contractor shall within 30 days following execution of the contract, submit a list of equipment and materials which are to be installed. The list shall include the name of manufacturer, size, and identifying number of each item. The list shall be supplemented by such other data as may be required, including detailed scale drawings of proposed minor deviations from the plans. If requested, the Contractor shall submit for review, design data and sample articles of the material proposed for use. All of the above data shall be submitted in duplicate except samples for testing. Following checking, correcting, and reviewing, two complete sets of drawings shall be submitted. The Department will not be liable for material purchased, labor performed, or work delayed before such review.

Upon completion of the work, the Contractor shall submit three complete sets of corrected plans showing all construction changes.

626.03 General All work shall conform to NEC and NESC standards as set forth in the NIST Handbook H-32, except when otherwise noted on the plans or in the Special Provisions.

The Contractor shall be responsible for and shall repair all damage caused to underground drainage structures, utilities or lighting conduit, which are encountered during construction.

626.031 Conduit If the trench for conduit is located in wet, spongy or otherwise unsuitable ground, the trench shall be further excavated to a depth sufficient to overcome this condition and shall be backfilled with approved gravel. The gravel shall be compacted in layers not exceeding 200 mm [8 inches], loose measure. The grade of the bottom of the trench shall be parallel to the proposed grade of the conduit.

Trenches for conduits shall be excavated to a width that will permit proper

installation of the conduit and to the depth shown on the plans or as directed.

Junction or pull boxes shall be installed as shown on the plans.

Where conduits enter exposed junction boxes, they shall be sloped to drain towards the conduit entrance holes, unless otherwise directed. Weepholes of 6 mm [¼ in] diameter shall be placed in all pull boxes, junction boxes, and fuse boxes.

After the trench has been excavated as specified, the bottom of the trench shall be prepared with a sand bedding material. After placing the conduit, sand shall be placed around the sides and over the top of the conduit, when shown in the special details. The entire trench shall then be backfilled with approved material, placed in layers not exceeding 200 mm [8 in], and thoroughly tamped.

All underground conduit shall be placed to at least the depth shown on the plans and shall not interfere with poles, guardrail posts, sign foundations or other objects.

All conduit ends shall be capped with conduit caps until wiring has begun. Prewired conduit shall be sealed during construction to prevent entry of moisture, dirt, or rocks.

The size and type of conduit required will be noted on the plans, except that the minimum size of conduit risers required for traffic signal installations shall be determined by percentage fill in a single conduit, as specified in the latest revision of the NEC. Where more than one conduit is required to be installed in the same location, the conduits may be placed in the same trench.

The weatherhead on conduit risers on Utility Company poles shall not be less than 300 mm [1 ft] from any utility wires. Conduit risers on Utility Company poles shall be located as required by the Utility Company.

Within 10 days after completion of each section of conduit, the Contractor, in the presence of the Resident, shall rod and pull through each duct a mandrel and brush of a pattern satisfactory to the Resident, but which shall not be more than 3 mm [• in] smaller than the bore of the ducts. Where obstructions in the ducts prevent passage of the mandrel, the Contractor shall, at their own expense, remove and relay those portions of the ducts necessary to clear the obstruction.

The Contractor shall install Number 9 US Steel Wire Gauge galvanized iron pull-wire in all unused conduits. The ends of the wire shall be secured in such manner as to prevent accidental withdrawal of the wire.

626.032 Metallic Conduit Installation Conduits shall be of the sizes noted on the plans, which are indicated as the nominal inside diameter. All conduits shall be joined with threaded couplings using approved thread sealant. Conduit shall be installed so that it is continuous and watertight between boxes or equipment. Running threads will not be permitted. When necessary, the Contractor shall use an approved electrical union-type coupling. Conduits shall be protected at all times from the entrance of water or other foreign matter. Conduit runs shall be made with as few couplings as standard lengths will permit. The total angle of all bends in one run and the radius of conduit bends shall conform to the NEC requirements. All field bends and offsets shall be made with approved hickey or conduit benders. Pull boxes shall be used wherever necessary to facilitate the installation of the wires.

In making up a run of conduits, all cut ends shall be reamed to remove rough edges and cut threads shall be painted with an approved thread sealant in such a manner that there will be no unprotected surfaces and joints will be watertight. All conduits shall have electrical continuity and shall be adequately grounded.

Conduits to be placed in the concrete superstructure of bridges and similar structures shall be securely supported and fastened, in order to maintain the conduits' position within the concrete superstructure, as shown on the plans. Pull boxes shall be located as shown on the plans. Clearance between conduit runs shall preferably be 50 mm [2 in], but at no time shall be less than the maximum size of the aggregate used in the embedding concrete. At all joints where relative movement between adjacent parts of a structure can occur, a double "O"-ring expansion coupling, or other approved expansion device shall be installed.

Exposed conduit shall be rigidly and securely fastened with acceptable fasteners or supports, as indicated on the plans or approved. Fasteners or supports shall not be placed more than 1.8 m [6 ft] apart on centers, except as otherwise authorized. Conduits shall generally be supported by an approved spacer at the point of support, so that there is an air space between the conduit and the supporting surface. Ends of conduit runs terminating in a metallic box without a threaded hub shall be provided with a metallic locknut on the outside of the box, and a metallic locknut and insulated bushings on the

inside. A lock washer and a galvanized steel flat washer shall be installed between the outside locknut and face of the box.

626.033 Polyvinylchloride Conduit Installation Polyvinylchloride conduit, hereafter called PVC conduit, shall be installed in accordance with the applicable methods as specified in Section 626.032 for metallic conduits.

PVC conduit shall be made watertight by joining with solvent or in accordance with the manufacturer's specifications.

Conduit shall be bent carefully to avoid damage and without the use of an open flame. Bends sharper than 45º [• bend] will not be permitted in PVC conduit. The total angle of all bends in one run and the radius of bends shall conform to the NEC requirements.

Conduits to be placed in the concrete superstructure of bridges and similar structures shall be securely supported and fastened, in order to maintain the conduits' position within the concrete superstructure, as shown on the plans. Pull boxes shall be located as shown on the plans. Clearance between conduit runs shall preferably be 50 mm [2 in], but at no time shall be less than the maximum size of the aggregate used in the embedding concrete. At all joints where relative movement between adjacent parts of a structure can occur, a double "O"-ring expansion coupling, or other approved expansion device shall be installed.

To allow for expansion and contraction of PVC conduit during installation of long runs, one end shall be left unconnected or a double "O"-ring expansion coupling shall be inserted near one end of the run until final covering of the conduit is in progress.

Where PVC conduit runs are placed parallel to other conduit runs or cross one over another, they shall be separated by a minimum of 75 mm [3 in] of sand or soil cushion. The bottom of trenches for PVC conduit shall be lined with a 75 mm [3 in] minimum bedding of tamped sand or soil before laying the conduit. Backfill to a compacted depth of 150 mm [6 in] above the top of the conduit shall be sand or soil, free from rocks or hard lumps.

At locations shown on the plans, or otherwise designated, conduit shall be constructed of schedule 80, PVC non-metallic conduit pipe encased in approved granular material as shown on the detail sheets.

When prewired conduit is installed, only those junction boxes necessary for underground splices shall be installed, unless otherwise directed.

Conduit and wire sizes of prewired conduit shall be as shown on the plans.

If the Contractor elects to plow-in the prewired conduit, the plowing shall be done with approved vibratory plowing equipment.

When prewired conduit is installed in a trench, the trench shall be prepared as previously noted in this Section for PVC conduit.

626.034 Concrete Foundations before placing concrete, the required elbows of entrance conduits, reinforcing steel and anchor bolts shall be carefully positioned. The anchor bolt size and the bolt circle diameter shall be determined from data furnished by the supplier of the poles or as shown on the plans. Anchor bolts for use with breakaway couplings, longitudinally grooved-type, shall be 25 mm [1 inch] diameter and shall project between 65 mm to 75 mm [2½ in and 3 in] above the top of the foundation. All other anchor bolts shall be a minimum of 25 mm [1 in] diameter and shall project sufficiently to accommodate the thickness of the base plus all nuts and washers. The bolt length shall also be sufficient to allow clearances of approximately 13 mm [½ in] below the leveling nut and 6 mm [¼ inch] above the top nut. At least two threads on each anchor bolt shall project beyond the outside of the nuts holding the plumbed pole.

Foundations shall be constructed of reinforced concrete with anchor bolts in accordance with the applicable requirements of Section 502, Section 503 and in conformity with the dimensions and details shown on the plans or the Contractor's approved design.

If the foundation is located in wet, spongy, or otherwise unsuitable material, the hole shall be further excavated to a depth sufficient to overcome this condition and backfilled with aggregate subbase material. The aggregate material shall be firmly compacted in layers not more than 200 mm [8 in], loose measure. Backfilling of foundation material shall conform to Section 206.03.

The surface area around the foundations shall be loamed and seeded in accordance with the requirements of Section 615 and Section 618.

Concrete foundations designated to be modified or removed shall be modified or removed as shown on the plans. Debris resulting from the modification or removal shall be removed f removal has been completed, the area shall be brought to grade by addition of granular material and loam, or by loam only, depending on the extent of modification or removal. The area shall then be seeded in accordance with Section 618.

Backfilling around the foundations shall conform to the requirements of Section 206.03. Backfill material shall be excavated material, unless considered unsatisfactory, in which case the material used for backfill shall meet the requirements of Aggregate Base-Screened. The finished ground at each foundation shall be graded flush with the top of the foundation, except at locations where the foundation is protected by guardrail. If required, approved backfill material shall be added to grade the slopes as specified. There will be no additional compensation for furnishing, placing and compacting material flush around the foundation.

When solid rock is encountered at less than the required distance below existing ground level, the construction method shown on the plans shall be followed.

The concrete portion of the foundations exposed to view shall have a troweled finish. A drainage groove shall be formed in the horizontal surface of the foundation. The top of the concrete foundation shall be horizontal.

When the anchor bolt template is removed, the threads of the anchor bolts shall be greased and protected with a metal sleeve, held in position with nuts and washers to be furnished with the bolts. This thread protection shall remain in place until the pole or other equipment is installed.

A copper-clad steel ground rod shall be installed when shown on the plans.

626.04 Method of Measurement Precast Concrete Junction Box, Foundations (all) and Remove or Modify Concrete Foundation will be measured by each unit.

All conduit will be measured by the number of meters [linear feet].

The quantity of structural earth excavation to be measured for payment below grade will be the amount actually excavated from 300 mm [1 ft] below the bottom of the

foundation, junction box or sand bedding to the required elevation, provided the maximum allowable horizontal dimensions do not exceed those bounded by vertical surfaces 230 mm [9 in] each side of the installation, as shown on the plans. The quantity of structural rock excavation to be measured for payment will be the number of cubic meters [cubic yards] actually removed, provided the maximum allowable horizontal dimensions do not exceed those bounded by vertical surfaces specified herein.

626.05 Basis of Payment The accepted quantity of foundations will be paid for at the contract unit price each for the number of foundations of the respective types. This payment shall include: anchor bolts, reinforcing steel, conduit within the foundation and extending 300 mm [12 in] from the foundation, loam, seeding, mulching and all incidentals necessary to complete the work.

The accepted quantity of junction boxes will be paid for at the contract unit price each. Payment for junction boxes shall include furnishing and installing precast concrete or bituminized fiber boxes as designated, including that portion of conduit extending 300 mm [12 in] outside the box.

Payment will be made for the total number of meters [linear feet] of each type of underground or exposed conduit actually furnished, installed, and accepted at the contract price per meter [linear foot]. This price shall include the cost of: furnishing and installing the conduit; excavating; furnishing special backfilling materials, pull wire, fittings, groundings and bonding; test cleaning interiors of conduits and all materials, labor, equipment and incidentals necessary to complete the work.

Excavating and backfilling for junction boxes, foundations and excavating, backfilling and sand bedding for conduit ducts will be considered included in the respective contract unit prices and no separate payment will be made, except as hereafter provided.

Excavating and backfilling as shown on the plans, or as required to overcome soft or otherwise unsuitable material, or for excavating rock will be paid for as provided in Section 206. Required backfill material, except sand bedding as shown on the detail plan, will be paid for as provided in Section 304.

Payment will be made for the total number of meters [linear feet] of prewired conduit actually furnished, installed, and accepted at the contract price per meter [linear foot].

This price shall include the cost of hand digging, trenching, or plowing; furnishing and installing the prewired conduit; and all labor, equipment and incidentals necessary to complete the work.

The accepted quantity of ground mounted cabinet foundations will be paid for at the contract unit price each, which payment shall include conduit within the foundation and extending 300 mm [12 in] from the foundation and for loam, seeding, mulching and all incidentals necessary to complete the work.

Prewired conduit within the foundations and extending 300 mm [12 in] from the foundation, and prewired conduit within the junction box and extending 300 mm [12 in] outside the junction box, shall be considered incidental to the respective contract unit prices for light standard foundations and junction boxes and no additional payment will be made.

The accepted quantity of Remove or Modify Concrete Foundations will be paid for at the contract unit price each. Such price shall include disposing of concrete removed, backfilling with granular material, loaming, seeding, and all incidentals necessary to complete the work.

Payment for restoration of roadway pavement, sidewalks, grass areas and resetting curbing removed in conjunction with this work, shall be considered incidental to the respective contract prices for each related item, except as otherwise provided.

Payment will be made under:

Pay Item		Pay Unit
626.11	Precast Concrete Junction Box: ___	Each
626.21	Metallic Conduit	meter [Linear Foot]
626.22	Non-metallic Conduit	meter [Linear Foot]
626.23	Prewired Conduit Secondary Wiring	meter [Linear Foot]
626.24	Prewired Conduit Primary Wiring	meter [Linear Foot]
626.31	450 mm [18 in] Foundation	Each
626.32	600 mm [24 in] Foundation	Each
626.33	750 mm [30 in] Foundation	Each
626.331	900 mm [36 in] Foundation	Each

626.34	Signal Pole Foundation	Each
626.35	Controller Cabinet Foundation	Each
626.36	Remove or Modify Concrete Foundation	Each
626.37	Special Foundation	Each
626.38	Ground Mounted Cabinet Foundation	Each

SECTION 627 - PAVEMENT MARKINGS

627.01 Description This work shall consist of furnishing and placing reflectorized pavement lines and markings, removing pavement lines and markings, and furnishing and applying reflectorized paint to curbing in reasonably close conformity with the plans and as designated.

627.02 Materials Materials shall conform to the requirements specified in the following Sections of Division 700 - Materials.

Pavement Marking Paint	708.03
Reflectorized Plastic Pavement Marking	712.05

Temporary Bi-directional Yellow Delineators shall be Temporary Object Markers (T.O.M.) as manufactured by the Davidson Plastic Company, 18726 East Valley Highway, Kent, WA 98031 or an approved equal.

627.04 General All pavement lines and markings shall be applied in accordance with the Manual on Uniform Traffic Control Devices.

Longitudinal lines placed on tangent roadway segments shall be straight and true. Longitudinal lines placed on curves shall be continuous smoothly curved lines consistent with the roadway alignment. All pavement markings placed shall meet the tolerance limits shown on the plans.

Broken lines shall consist of alternate 3 m [10 ft] painted line segments and 9m [30 ft] gaps.

Temporary pavement marking lines, defined in Special Provision Section 652, Maintenance of Traffic, Temporary Centerline**,** will be applied as many times as